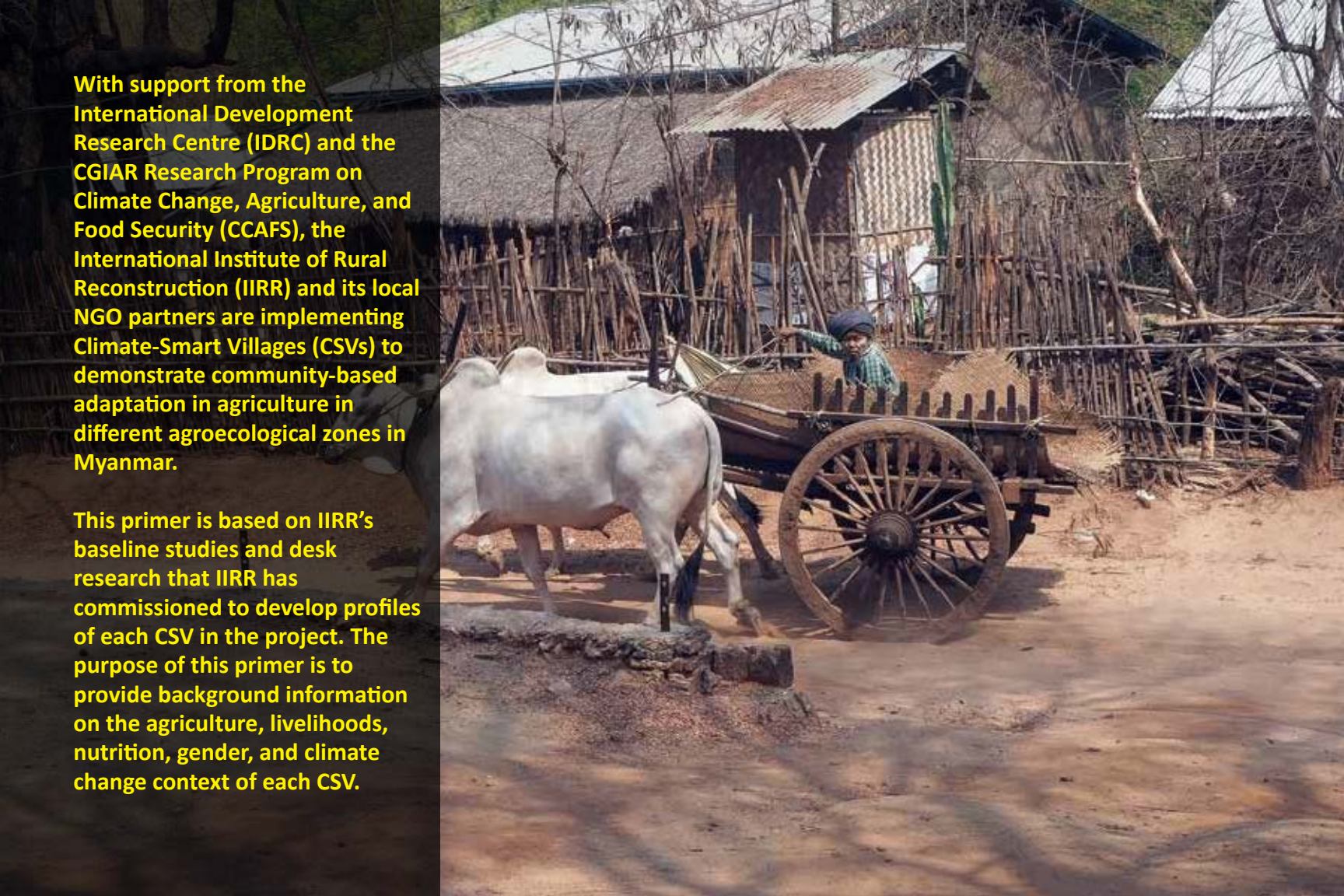
Regenerating drylands in response to a changing climate



With support from the International Development Research Centre (IDRC) and the CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS), the International Institute of Rural Reconstruction (IIRR) and its local NGO partners are implementing Climate-Smart Villages (CSVs) to demonstrate community-based adaptation in agriculture in different agroecological zones in Myanmar.

This primer is based on IIRR's baseline studies and desk research that IIRR has commissioned to develop profiles of each CSV in the project. The purpose of this primer is to provide background information on the agriculture, livelihoods, nutrition, gender, and climate change context of each CSV.

Climate change and natural disasters in Myanmar have adversely affected lives, livelihoods, and natural resources. Food security and the nutritional well-being of poor households are most at risk. Climate risks will continue to threaten agriculture, nutrition, and enterprises of farming households and landless workers.

Water is scarce in the dry zone and the priority always is for humans and livestock use. Very efficient use of water is practiced.

Preparatory anticipatory measures are needed to develop a portfolio of technological and social interventions/ innovations to address these risks. Just as important is the need to strengthen community level capacities to innovate and adapt to climate change.

Climate-Smart Villages (CSVs) provide local platforms to test, develop, and outscale Climate-Smart Agriculture (CSA) technologies and social processes. Because the manifestations of climate change differ from site to site, these CSVs help generate potential solutions for each unique agroecological, sociocultural and market situation. Participatory action research is an important element of this effort. Adaptation capacities are built in a gradual manner to identify solutions of local relevance.

These social and institutional processes are usually referred to as community-based adaptation (CBA). These processes include action research, strengthening of groups, leadership development, and farmer-to-farmer extension. Location–relevant approaches help facilitate horizontal, local, and spontaneous outscaling. Farmer-to-farmer diffusion is nurtured.

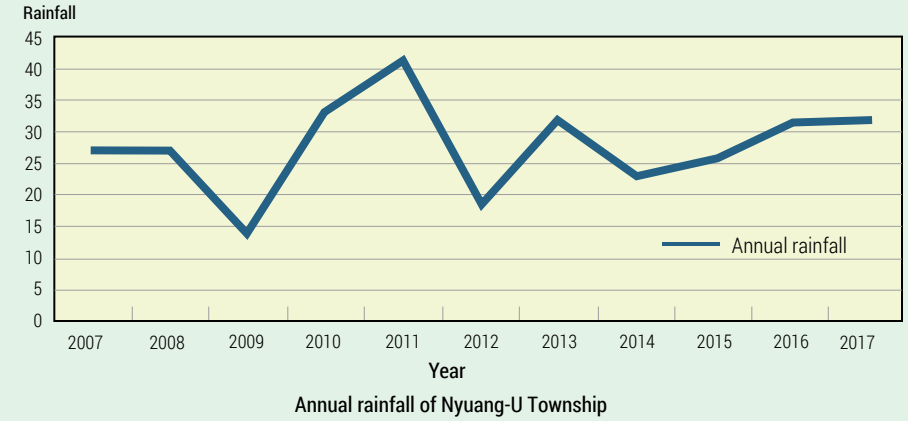
These local processes are best undertaken in local townships or municipalities. These CSVs serve as platforms for generating evidence as basis for learning, sharing, and advocacy. Wherever feasible, local funding is leveraged in an effort to build local ownership and demonstrate the potential for scalability. With time, CSVs emerge as models for other local governments, civil society, and investors.

The central dry zone of Myanmar is characterized with low and unpredictable rainfall, degrading soils with low fertility, and an environment that is rapidly desertifying. Water is scarce and so are trees.

Nyaung-U Township in the Central Dry Zone (where the CSV is located) often has the highest temperature in all the regions of Myanmar. It has a maximum temperature of 33 to 35°C. At times, temperatures during summer can reach 40°C.

Rainfall in Nyaung-U is less than 40 inches a year and is generally erratic, variable, and unevenly distributed. This complicates the crop planning decision-making processes.

Figure 2: Rainfall Trend in Nyaung-U Township from 2007 to 2017.



Source: Department of Meterology and Hydrology, Nyaung-U Township

Over the centuries, farming communities in the central dry zone of Myanmar have coped with limited rainfall, poor soil fertility, and unpredictable weather. To reduce risks, they rely on a range of "climate smart" crops. Most of the sesame, peanuts, sunflower, pigeon pea, and chick pea in Myanmar are grown in the dry zone.

Farmers in the central dry zone already practice many elements of what we now refer to as Climate-Smart Agriculture (CSA). They take full advantage of the limited rainfall and soil moisture. Farmers undertake very early land preparation in order to “harvest” water from early rain showers.

They use varieties that are known to perform under limited fertility conditions (eg. legumes which fix nitrogen by themselves) and they rely very little on chemical fertilizers. Instead, they depend on micro-nutrient rich animal manure and compost. However, low dosage of chemical fertilizers, when used at the right time boosted yields and biomass.

Traditional farms and farming systems in the central dry zone are nutritionally sensitive. There are very few farming communities in Southeast Asia where there is such a heavy emphasis on protein-rich legumes and mineral-rich millets (mung beans, pigeon peas, peanut, dolichos, millets, and sesame).

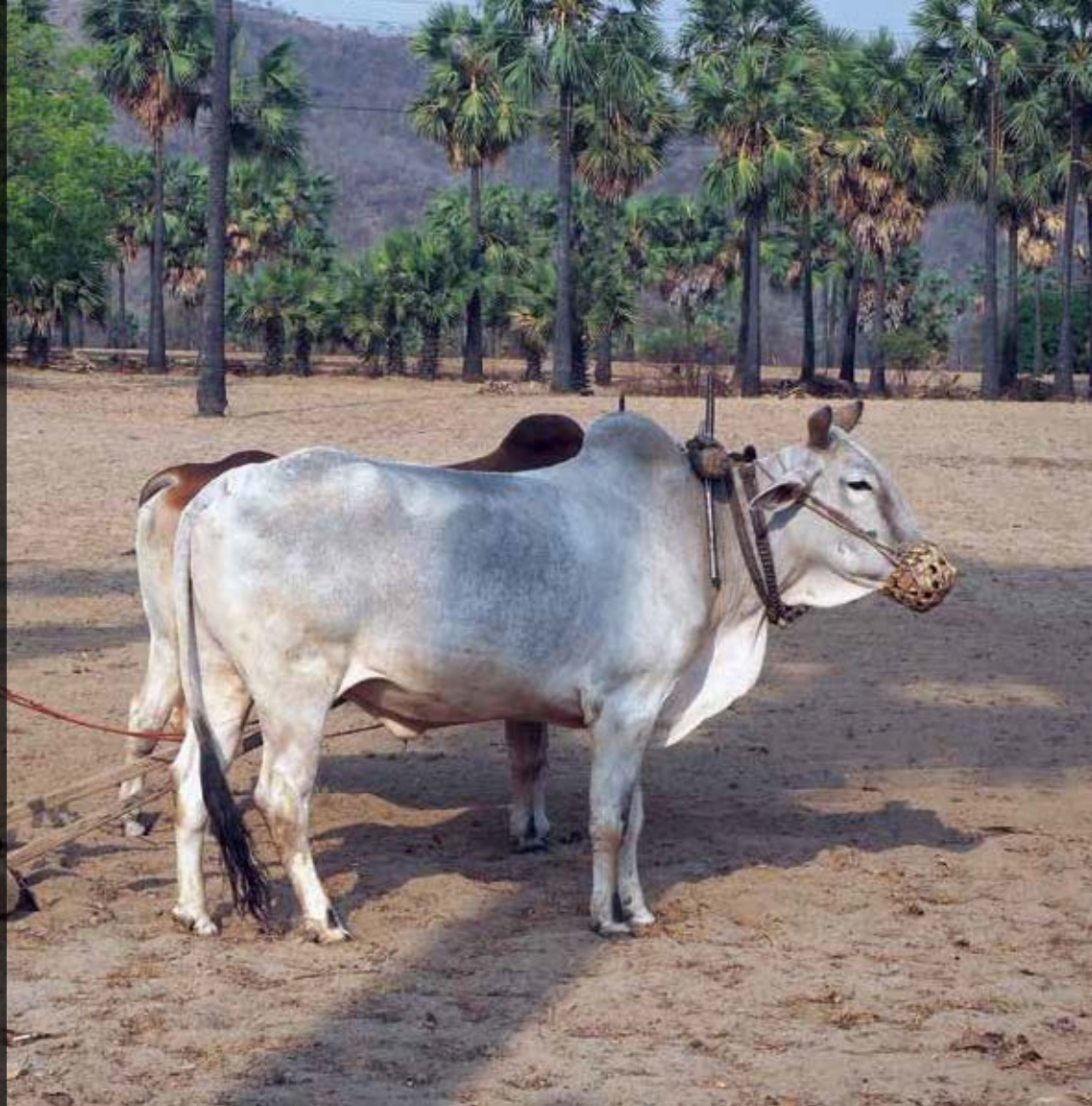
Local food culture features greens, legumes, sesame, and peanut oil which provide minerals, vitamins, and carbohydrates. Snack foods are also nutritionally important. These attributes of local food systems (the food culture associated with it) need to be protected, encouraged, and conserved.

The rich agrobiodiversity in the central drylands of Myanmar can be characterized as climate-smart and nutritionally relevant. Their conservation through productivity enhancement and sustainable use are high priorities for proponents of CSA.

Farmers conserve valuable livestock agrobiodiversity in the central dry zone. Cattle provide tillage, manure, transportation, and other ecosystem services. These animals are raised via low carbon footprint and rely on locally sourced feed and residues. Livestock rely on palm trees and palm nuts for protein- and mineral-rich supplements during the long dry season.

These farm animals are economic assets serving local communities well in case of crop failure. CSA can provide pathways to further enhance productivity, improve animal health care, and improve feed resources through agroforestry interventions. The Bagan goat is a climate-handy and valuable livestock biodiversity resource.

Livestock is an important asset building approach for small farmers in Myanmar. These are important coping mechanisms in case of crop failure. Pigs and cattle are economic assets, which enhance resilience building, and are sold for cash during difficult times (IIRR baseline study) .



Livestock are raised for meat. Most of the meat consumed by households are farm grown (ie. not purchased). Similarly, eggs and poultry, though consumed on a fairly regular basis, are rarely purchased from outside (IIRR baseline study).

The dry zone of Myanmar would benefit from CSA that supports fodder trees and grasses grown in community forests and in homesteads and school areas. Fodder banks in schools can help farmers with emergency sources of fodder during the dry season.

The restoration of community forests and other common property areas is a critical approach to transforming the environment and landscapes around villages and farms. They serve as fodder and fuel banks for communities during emergencies.

Traditional knowledge and capacities for local innovation have characterized these communities. This capacity to innovate can be directed towards the anticipated challenges of climate variability. Here, farmers store peanut seed for over six months via very innovative humidity and temperature management methods.

NOTE: Peanut seed storage is a complicated process as seeds cannot normally be stored for more than 3-4 months due to high oil content and rancidity that affects seed germination. Farmers in Nyaung-U have overcome this problem through indigenious seed storage methods they have developed.

Continuous crop cultivation, over-extraction of vegetation, and feeding of all crop residues to livestock have degraded the soils in the dryzone. Low soil fertility levels, low organic matter, and enhanced soil erosion reduces productivity year per year. This yearly “soil mining” further makes farms vulnerable to climate change.

Cereal, grains, oil, fish, and exotic vegetables are purchased from the markets. Overall, farm households suprisingly have a moderate level of dietary diversity. These are good practices that should be conserved. Green leafy vegetables, roots and tubers, and legumes are eaten fairly regularly. These are farm grown or collected from the wild (IIRR baseline studies).

CSA programs should consider distributing diversity kits of planting materials (intra species, varietal diversity of beans, green leafy vegetables, roots, tubers, and millets) as part of an effort to restore or strengthen local agrobiodiversity. Planting materials can even be sourced from markets.

Without rebuilding soil organic matter and reducing degradation, farmers will not be able to take full advantage of CSA and new crops and varieties and other CSA options. In the CSV in Nyaung-U, farmers are planting *Cassia Siamea,* a non-browsable tree that is planted on farm boundaries primarily to rebuild soil organic matter and reduce the effects of winds.

Buildling on the local farming systems (proven to be relatively resilient), CSA programs can also help introduce new cultivars and varieties from research stations for trial and observation in CSVs. Here, pigeon pea and green gram from the Nyaung-U research station are being tested in a CSV.

In the Nyaung-U CSV, efforts are also made to re – introduce traditional crops which have been lost. Dolichos lab and sorghum from other parts of Myanmar (with analogous climates) were sourced and introduced for small-scale testing and promotion.

Sorghum used to be an important crop in Nyaung-U but farmers shifted to planting peanuts (a crop that has proven to be more risky) due to better market opportunities. A renewed role for sorghum without totally replacing peanuts should be considered.

Sorghum is also featured as a green fodder source for livestock. Its grains are rich in protein, B1, B2, and B3. It is being re-introduced as feed for chickens and as concentrate for pigs, goats, and cattle.

Some farmers in the dry zone already understand the need to prepare feeds from sorghum residues. They mix green and dry sorghum stalks by chopping it finely and mixing it with grains and peanut waste. This is a low carbon footprint feeding system that needs wider promotion.

There is a role for new ideas. In Nyaung-U, dryland horticulture is being introduced. Twenty-five farmers in the CSV are growing mango trees (known as a drought tolerant crop once established for 2 years). The spaces in between are used for annual crop cultivation.

There are various methods to grow trees in dry areas. These include shading , protecting them from grazing animals, deep pit planting for conserving water in sandy loam soils, and applying mulch around each tree.

Aside from farms, homesteads (which currently only have livestock components) can also be used for CSA interventions. Small-scale fruit production, vegetable production, small livestock, and value addition processing are examples of CSA for homestead spaces.

Homesteads and schools offer "new" spaces for using CSA to empower the poor, tenants, women, and the landless. Homesteads and schools in Myanmar are endowed with land that is often underutilized. These can be transformed into bio-intensive backyard gardens.

Landlessness is a major concern in the dryland areas. Livestock can be a special CSA for the landless provided that fodder and water needs are considered. Improved livestock productivity rely on better feed and water management practices.

At the start (year one), every CSV has to undertake a baseline survey, conduct participatory vulnerability studies, and identify climate, food security, and livelihood risks.

Participatory trials help build capacities to adapt to climate change and to address poverty in an incremental fashion. With time, a portfolio of CSA options and associated social processes are identified for each CSV.

Location-specific Participatory Varietal Selection (PVS) trials provide opportunities for determining which varieties are best suited to the area. The Dryland Research Station in Nyaung-U provides proven varieties to farmers for on-farm testing.

Women farmers and female-headed households provide new opportunities for CSA introduction, especially of small livestock, fruit trees, and intensive vegetable production. With proper targetting of households, CSA can be a tool for the economic empowerment of women.

When a critical mass of farmers in a CSV become engaged in addressing climate change, nutritional, and poverty risks, these villages emerge as focal points for learning, sharing, and outscaling to other villages in the township. Local farmers play a big role in this process, with research, government, and civil society playing primarily a facilitating role.

Resilience to climate disasters is closely associated with higher levels of farm biodiversity (polyculture, agroforestry, and small livestock). Accumulated farmer experience resulting from their interaction with their local environment provides a strong foundation for introducing improvements (ie. building on what people already know best).

When local communities become engaged in finding solutions to their climate risk and livelihood priorities, our chances for outscaling and sustainability are greatly enhanced. CSVs provide this opportunity for demonstrating wider uptake of CSA.

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